BANGALORE ELECTRICITY SUPPLY COMPANY LIMITED

TECHNICAL SPECIFICATION FOR RABBIT ACSR CONDUCTOR

1.0 SCOPE:

This specification covers manufacture, testing at manufacturer's works and supply of Rabbit ACSR conductor.

2.0 The basic technical and other particulars of the equipment and the various components are specified in the following sections and tender schedule.

3.0 CONSTRUCTION:

3.1 ACSR Conductor: The conductor shall comply in all respects with the latest edition of IS-398 (Part-II) 1996 with its latest amendment. The Aluminium wires used in the manufacture of the conductor shall be of the highest electrical quality and free from scratches, die marks and other surface imperfections. The Aluminium of H2/H4 grade aluminium Purity: 99.7% and Resistivity: 0.028264 $\Omega mm^2/m$. They shall be reinforced with a central core of galvanized high tensile steel wire having negligible sulphur and phosphorous contents.

3.2 The steel wire shall not be subject to any heat treatment after being galvanized. The zinc coating of steel wires shall be smooth and of uniform thickness. There shall be no bare spots owing to adherence of scales or other causes.

3.3 Joints in wires: Joints in the individual Aluminium, wires are permitted but no two such joints shall be within 15 meters apart in the complete stranded conductors. There should be no joints in the galvanized steel wire except those made in the base rod or wire before final drawing forming the core of steel reinforced Aluminium.

3.4 The resistance of the individual Aluminium wire shall be determined separately before stranding by means of standard tests on sample wires. The test samples shall be of sufficient length to give an accuracy of atleast one part in a thousand.

3.5 The ACSR conductor size and standard lengths shall be as per IS 398 (Part-II) 1996 with its latest amendments and as indicated below.

Code Name of Conductor	Nominal Aluminum Area	Dia of wires in mm		Sectional Area of Aluminum (mm^2)	Total Sectional Area (mm^2)	Extend calculated Resistance at 20°C (Max)	Appx. Calculated breaking load in KN	Appx. Over all dia (mm^2)	Std, length in Mtrs.	App. Mass Kg./ Km.
		Aluminum	Steel							
Rabbit	50 Sq.mm	6/3.35	1/ 3.35	52.88	61.70	0.5524	18.25	10.05	1400	214

4.0 STANDARD SIZES OF WIRES: The Aluminium wire and galvanized steel wire for the standard construction of conductors have diameter specified as shown below, as per Tables 1&2 Section of IS 398 (Part-II).

TABLE-1: Aluminium Wire used in the construction of Aluminium Conductors Galvanized Steel Reinforced.

Diameter in mm			Cross Sectional area of nominal dia wire	Mass	Resistance at 20^0 C ohm/Km.	Breaking load	
Nominal	Minimum	Maximum				Before stranding	After stranding
3.35	3.32	3.38	8.814 mm^2	23.82 Kg/Km.	3.265	1.43 KN	1.36 KN

TABLE-2: Steel wire used in the construction of Aluminium conductors galvanized steel reinforced.

Diameter in mm			Cross Sectional area of nominal dia wire	Mass	Breaking load	
Nominal	Minimum	Maximum			Before stranding	After stranding
3.35	3.28	3.42	8.814 mm^2	68.75 Kgs/Km	11.58 KN	11.0 KN

5.0 LAY RATIO: Ratio of the axial length of a complete turn of the helix formed by the individual wire in a standard conductor to the external diameter of the helix.

The lay ratio shall be as shown below.

TABLE-3: Lay Ratios of Aluminium Conductor, Galvanized Steel Reinforced.

Number of Wires		Ratio of Aluminium wire dia to Steel wire dia	Lay ratio for steel core		Lay ratio for Aluminium outside layer	
Aluminium	Steel		Minimum	Maximum	Minimum	Maximum
6	1	1.00	-	-	10	14

Note: For the purpose of calculation, the mean lay ratio shall be taken as the arithmetic mean of the relevant minimum and maximum values given in this table.

6.0 TESTS & INSPECTION OF RAW MATERIAL AT SUPPLIER'S WORKS:

6.1 Within two weeks of receipt of each consignment of raw materials viz., steel, Electrolytic Aluminium rods, etc., at the manufacturers works, the contractor shall furnish to the purchaser in triplicate the raw material manufacturers certificates.

6.2 The test certificates shall cover all tests on required number of samples as stipulated in clause 13.1 of IS. (Part-II) 1996 with latest amendments if any.

6.3 The manufacturer shall not commence manufacturing the conductor ordered prior to purchaser's approval of the test certificate for raw materials.

6.4 Similarly test certificates in triplicate for tests on the finished ACSR conductor shall be submitted. The suppliers shall furnish along with RCs, the number of pieces of conductor in each reel and the length of individual pieces.

6.5 All tests as detailed in clause 13 of IS-398 (Part-II) 1996 with its latest amendments shall be carried out on conductors covered by this specification and shall be submitted by the contractor for purchaser's approval within four weeks of the acceptance of the letter of intent of the purchaser. No change in the schedule of tests, unless desired by the purchaser shall be subsequently made by the contractor or his sub-contractors of the manufacturers without prior – consent of the purchaser.

6.6 The purchaser may at any time call for any tests that are laid down in the specification as optional tests. The contractor shall arrange to carry out such tests expeditiously at his own cost. The certificates for such optional tests shall be submitted to the purchaser for approval.

6.7 The contractor shall notify the purchaser, at least fifteen days in advance, the time of manufacture so that inspection of materials during manufacture and or witnessing of the tests can be arranged. If the purchaser waives inspection he will advice the contractor accordingly. Inspection shall also include method of packing and stacking of finished materials in the works.

6.8 Type tests:

The following type tests shall be conducted before manufacturing/ as per BESCOM requirement.

a) Surface condition test,

b) Test for ultimate breaking load on stranded conductor,

c) Stress-strain test,

d) Measurement of diameter of individual aluminium and steel wires,

e) Measurement of lay ratio,

f) Breaking load of individual wires,

g) Ductility test,

h) Wrapping test,

i) Resistance test,

j) Galvanizing test.

6.9 Acceptance Tests:

k) Visual and dimensional check on Drum	:	Ref. Test Procedure
l) Visual check for joints, scratches Etc. and lengths of conductor	:	- do -
m) Dimensional check on steel and Aluminium strands	:	- do -
n) Check for lay ratios of various Layers	:	- do -
o) Galvanizing test on steel strands	:	- do -
p) Torsion and Elongation test on Steel strands	:	- do -
q) Breaking load test on steel and Aluminium strands	:	- do -
r) Wrap test on steel and aluminium Strands	:	- do -
s) DC resistance test on aluminium Strands	:	- do -
t) UTS test on welded joints of Aluminium strand	:	- do -

NOTE: All the above tests except test mentioned at (j) shall be carried out on aluminium and steel strands after stranding only.

6.10 Routine Tests:

a) Check to ensure that the joints are as per specification.

b) Check that there are no cuts etc on the strands.

c) All acceptance tests as mentioned in Clause 6.9 above shall be carried out on each coil.

6.11 Tests during Manufacture:

a) Chemical analysis of zinc used : Ref. Test Procedures
For making galvanising

b) Chemical analysis of aluminium: - do -
Used for making aluminium strands

c) Chemical analysis of steel used : - do -
For making steel strands

7.0 <u>Packing</u>: Drawing of the reels/drums shall be enclosed with tenders. The ACSR conductor reels shall be of dimensions approved by the purchaser and made of seasoned wood sufficient strong and in sound condition to ensure that the reels shall reach the site intact with lagging end free from damage due to transport hazards by rail and over land. These reels shall conform to IS 1778/1981 with latest amendments if any.

a) The standard length of the ACSR conductor shall be as per schedule of materials specification. Longer lengths are acceptable. However, short lengths not less than one Km. each are acceptable to the minimum extent of 5% of the quantity ordered.

b) The contractor shall submit in duplicate detailed packing specification for the conductors for the purchaser's approval at least fifteen days prior to commencement of dispatch. Finally approved specification shall be furnished along with the dispatch documents.

8.0 If BESCOM Desires "On receipt of the specified lots of Conductor from the factory at site/stores by BESCOM, a team consisting of one person from the supplier, one person from BESCOM shall select a sample of sufficient size, as per relevant ISS and conduct all type tests at CPRI Bangalore only. Payment of type testing charges will be considered after the receipt of satisfactory results.

In case of failure, the entire lot will be rejected and another sample will be referred to Bureau of Indian Standards (BIS) as a complaint for assessment of quality of the manufacturer." In the mean while the supplier/Manufacturer shall have to replace the entire lot with good quality conductor.

9.0 REEL OR DRUM SHALL BEAR THE FOLLOWING INFORMATION

a) Reel or drum number

b) Size and description of contents

c) Length of each piece of conductor (on reels)

d) No. of pieces in each package/reel

e) Gross weight

f) Net weight

g) Purchase order No. & Date

h) Place and designation of consignee

The above details shall be legibly and indelibly marked.

10.0 The Bidder shall upload the guaranteed technical particulars as per the Proforma enclosed.

Sd/-
General Manager Ele,
QS&S, BESCOM

Guaranteed Technical Particulars

Name of the bidder		
Sl. No.	**Particulars**	**Bidder**
1	Maker's Name, Address & Country	
	a) Aluminium rods	
	b) Steel wire/rods	
	c) Complete Conductor	
2	Stranding and Wire Diameter (mm)	
	a) Aluminium	
	b) Steel	
3	Nominal Aluminium area in Sq.mm.	
4	Sectional Area of Aluminium Strands in Sq.m.m.	
5	Total Sectional area in Sq.mm.	
6	Cross sectional area of nominal diameter wire in Sq.mm.	
	a) Aluminium wire	
	b) Steel Wire	
7	Overall diameter of conductor in mm.	
8	Breaking load of conductor in Kg.	
9	Minimum breaking load in Kg. for	
	a) Aluminium wire	
	b) Steel Wire	
10	Zinc coating of steel wire	
	a) Uniformity of coating No. and duration of dips (Process test with stood I min. X Nos.)	
	b) Minimum weight of coating (grm./Sq.mm.)	
11	Mass in Kg. per Km.	
	a) Aluminium wire	
	b) Steel Wire	
	c) Conductor	
12	Resistance in Ohms per Km. at 20 Deg.C.	

	a) Continuous maximum current rating of conductor (Amps) in still air or 45 Deg.C ambient temperature.	
	b) Temperature rise for the above current Deg. C.	
13	Purity of Aluminium Rods	
14	Maximum working tension for complete conductor Kg.	
15	Modulus of Elasticity (Kg/sq cm X 10^6)	
	a) Aluminium	
	b) Steel	
	c) Conductor	
16	Co-efficient of linear expansion per degree	
	a) Aluminium	
	b) Steel	
	c) Conductor	
17	Standard length of each piece in Km.	
18	Tolerance, if any on standard length	
19	No. of standard lengths in one reel	
20	Approximate dimensions of the reel in Cms.	
21	Mass of the conductor in one reel in Kg.	
22	Gross mass of the reel including mass of the conductor.	
23	Mass of the reel in Kg.	
24	Standard according to which the conductor will be manufactured and tested.	
25	Date of commencement of production of conductor.	
26	Other Particulars	

Manufacturer seal & Sign